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Growth in the Real Size of Government since 1970*

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ABSTRACT

From at least 1893 economists have viewed income as an important determinant of government size and the hypothesis that government size increases with income is now enshrined in the literature as Wagner's Law. More recently, however, public choice economists and growth theorists have tended to reverse that causality by questioning whether government size is a constraint on (or promulgator of) economic growth. Typically, increases in government size arising from increased consumption are viewed as constraints on growth, while increases in size that arise from government investment are viewed as positive in their effect on growth.

In this paper we are concerned with the two-way interrelationship between government size and income growth highlighted by these separate literatures and investigate this relationship in three distinct stages. In the first part of the paper we set out what has actually happened to the real size of government for twenty OECD countries over the period since 1970 and survey some of the newer factors and approaches used to explain its more recent evolution. The second part re-estimates the parameters of the demand curve for government allows us to speculate whether the changing pattern of government growth represents a break in the structure of the model determining government size or, more simply, represents a change in the variation of the underlying variables. We find that the same model works at least as well as it did in earlier periods with coefficients that are close to their earlier estimates. We follow this by estimating a simple growth model that highlights the size of government consumption in relation to income and output growth for the same countries over the same time period. Increases in size do appear to constrain economic growth.

The third part of our paper recognizes that while each of the two causal relationships has received considerable attention in their own right, less attention has been given to effecting a separation of their co-mingled effects. To do so, we estimate the two relationships simultaneously in the context of our panel. This allows us assess whether ignoring the simultaneity of the two-way relationship seriously biases the measure of either the income effect (in determining government size) and/or the measure of government's effect on economic growth when each are estimated separately. While our discussion suggests that single equation estimates of the income elasticity in Wagner's Law may have been biased upwards (in absolute terms) and the constraining effect of government size on growth biased downwards, our three stage estimates finds only modest support in the data.

The paper concludes by exploring the interrelationship between government size and government regulation. In particular, we test the hypothesis that the appearance of slower growth in government side is due to the increased substitution of indirect control of private production for direct governmental output. On cross sectional data, we find the opposite. In our sample, larger government size is associated with more rather than less regulation.

1. Introduction:

In this paper we survey what has happened to the real size of government since 1970. We begin by simply describing what has happened to government size in a sample of twenty countries from the Organization for Economic Cooperation and Development (OECD) for the period following 1970. We follow this with a selective summary of the current literature, especially that which emphasizes the new factors and techniques used to explain the different pattern of change that has arisen over this time period. In this regard, the traditional literature on government size assumes that causality runs from income to government size.

The second part of our work updates the estimates of the key parameters described in our literature review for a panel of twenty OECD countries. We begin by re-estimating the parameters of the demand curve for government services for the 1970-97 time period. This allows us to inquire whether the changing pattern of government growth observed over this period has meant a break in the structure of the model determining government size. Next we reverse the direction of causality to examine the role of government size in relation to growth by estimating its impact within a simple growth model. While both government size and economic growth relationships have received considerable interest in their own right, less attention has been given to their interdependence. Without such recognition the two effects become co-mingled in each single equation coefficient. To make such a separation, we estimate the two equations simultaneously. This allows us ask whether ignoring the simultaneity of this two-way relationship seriously biases the measure of the income effect (in determining government size) and/or the effect of government size on economic growth when each are estimated separately.

In the first two parts of this paper we use the conventional measure of government size, i.e., aggregate government consumption from the Gross Domestic Product (GDP) side of the National Accounts divided by GDP, as our measure of the government's influence on the economy. In the final part of our survey, we consider whether this ratio has remained an appropriate index for the scale of government's activities. Most economists recognize that government has considerably more influence on society than the level of expenditure alone would suggest. In most countries, for example, governments set up and maintain (through legislation and often subsidy) operations which would otherwise be undertaken by private corporations (e.g., postal services, public utilities, hospitals). These frequently operate outside of the government's budget. In other cases, the government extends its influence by its granting (or withholding) preferential loans, import/export licenses etc. Finally, through its regulatory powers, governments can exercise a strong presence in the operation of the economy without its role ever appearing as an expenditure item. In this sense the observation that the traditional measure of government size is leveling off or even shrinking may well mislead if the role of government has simply changed from one of direct spending to one of indirect influence through regulation.

2. Recent Changes in the Size of Government:

We begin our historical survey of government size by noting that unlike earlier periods, it is no longer the case that real government size has only grown. While the average annual rate of growth for our group of twenty OECD countries has remained marginally positive for the period since 1970, individual countries in our sample have experienced widely different growth rates.[1] In the United States, for example, the share of government consumption in GDP fell – from 18.5% in 1970 and to roughly 15.5% by 1997. In the period following 1980, Belgium, Italy, and the Netherlands experienced similar declines. As the positive average growth rate does imply, however, a fall in the size of government was neither universal nor even typical. Particularly since 1975, government size has grown rapidly in such OECD countries as Austria, Finland, France, Greece, Ireland, Norway, Portugal, Spain, and Switzerland. Countries that experienced no overall change in size were least common, with Sweden and Korea representing these special cases.[2] Finally, for at least some subset of countries, real government size has appeared to peak. Australia, Belgium, Canada, Germany, Italy, Japan, the Netherlands and U.K. all experienced an initial period of growth followed either by no change or by a period of contraction. With such a variety of different outcomes straightforward generalization becomes problematic. Perhaps the safest generalization is simply that the pattern of growth in government size since 1970 has been much more varied than the pattern of continuous growth experienced in the period prior.

2. a. The Literature on Real Government Size

We take as the starting point for our survey of the more recent literature, Borcherding's survey articles (1977 and 1985) on the determinants of government size. To explain the continuous rise in U.S. government size through 1970, Borcherding derived the following equation:

$$\dot{g} = (\eta + 1)\dot{p} + (\delta - 1)\dot{y} + (\alpha\eta + \alpha - 1)\dot{N} + \eta\dot{t} + \delta\dot{k} + \phi\dot{m}, \qquad \textbf{(1)}$$

where the dots above the variables signify rates of growth and where g is the share of government spending in aggregate real output, p is the relative price of government services (to all other goods), y is mean income, N is population size, t is the share of the cost of government borne by the median voter, k is the ratio of median to mean income, and m is a set of political control variables. The parameter η represents the price elasticity of demand for government consumption; α, the degree of publicness of the output of the government sector; δ, the income elasticity of demand and; φ, the set of

[1] The mean annual rate of growth of government consumption as a fraction of GDP was 0.682% for the twenty OECD countries in our sample (from 1971 through 1997).

[2] Sweden continued to have (by far) the largest percentage of GDP in government consumption (53%) while Korea stood among those with the lowest (11%).

elasticities for the effect of the various political controls on demand. If the median voter pays a representative share of the cost of government, then (1) simplifies to

$$\dot{g} = (\eta + 1)\dot{p} + (\delta - 1)\dot{y} + (\alpha - 1)(\eta + 1)\dot{N} + \delta\dot{k} + \phi\dot{m}, \qquad \textbf{(2)}$$

a useful form for estimating the effects of the different variables on real government size. In addition, equation (2) provides a convenient taxonomy for discussing the research done on real government size and the consensus that has grown up over the size of the model's key parameters. The time period that follows Borcherding's work can be characterized as one of moving from single equation to system estimation with greater emphasis being placed on time series issues and wider use of panel data. Having said this, the parameters of greatest interest to most public finance economists remain those emphasized by Borcherding. For this reason, then, we organize our survey of the recent literature in terms of these parameters.

2.b. The Elasticity of Demand for Government Services and the Baumol Effect

Discussion of the relationship between real government size and the price of government services is now an integral part of the debate over Baumol's Cost Disease hypothesis.[3] Baumol (1967) hypothesized that because the output of the government sector is relatively labor intensive, its rate of productivity growth would be expected to be low relative to that of private sector output. This implies that over time the real cost of public sector output will rise relative to all other goods. It then follows that if the demand curve is price inelastic, a rise in the relative price of government services will result in only a relatively small decrease in the quantity of government services demanded and hence a higher aggregate expenditure on public sector output. Studies by Bradford, Malt and Oates (1969), Beck (1976), Spann (1977), Peltzman (1980), Berry and Lowery (1984), Ferris and West (1996b, 1999) all have documented the steady rise of the relative cost of U.S. government services. Borcherding (1977) calculates the U.S. pre-1970 average growth rate to be about 1.5% per annum and our calculations from a more recent panel of data through 1997 (presented in the next section) suggest that while the growth trend has fallen, it has remained positive.[4] With positive growth in the relative price of government services through time, a necessary condition for the emergence of the Baumol effect is that the parameter estimate on $\dot{p}$ ($(\eta+1)$ from equations (1) and (2)) be between 0 and 1.[5] Early estimates of the price elasticity by Borcherding and Deacon (1972) and Bergstrom and Goodman (1973) point to a value of $\eta+1$ of around 0.5 (or a value of $\eta = -0.5$). Borcherding's (1985) summary of U.S. federal, state and local expenditure data from 1902 to 1979 found the average value for η closer to -0.4. Given this latter value for the elasticity parameter, Borcherding argued that if the government's share of GDP evolved as in equation (2), then the price effect alone would account for 31% of the growth in U.S. government size that took place between 1902 and 1979.

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[3] See Baumol (1967).

[4] The average annual rate of growth of the price index of government sector output relative to the GDP deflator for the countries in OECD sample over 1970 and 1997 was .8 percent. See also Baumol (1993).

[5] That is, $-1 < \eta < 0$, implying that the demand curve must be inelastic.

While many have debated the reasons why the real cost of government services has risen in the past and Baumol's accompanying prediction that this will continue into the future,[6] the hypothesis that the demand curve for government services is price inelastic is now standard in the literature.[7] One might have thought, however, that the typical finding of a low value for the price elasticity of demand in a single equation model could well have arisen from the inability of a single equation technique to separate out offsetting demand and supply influences on observed outcomes. Simultaneous re-estimation of the demand and supply system, however, only confirms what is implicit in the single equation approach, namely that variations in a constant cost supply curve trace out positions of equilibrium along a stable demand curve.[8]

2.c. The Income Effect and Wagner's Law

One of the oldest ways of explaining public sector growth is associated with the well known German economist Adolph Wagner [1835-1917] and what is commonly known as Wagner's Law, or, the "law of expanding state expenditure". Wagner noticed "empirical regularities" in the growth of central, local and public enterprises expenditures and observed there appeared not only to be an absolute but also a relative expansion of the public sector as economies develop.[9] Wagner's ideas have motivated a large number of studies in the literature. This section reviews a small part of this literature, with greater emphasis given to newer studies that pay greater attention to the time series problems in the actual data.

Confusion sometimes surrounds the testing of Wagner's Law because different authors use different specifications of the test. Some of the earliest studies, in particular those by Musgrave (1969) and Goffman and Mahar (1971), test for the presence of Wagner's Law by looking at the ratio of government spending relative to per capita income, our δ-1 in equation (2) above. In this form of the test, their finding that this elasticity was greater than zero was interpreted as yielding support for Wagner's Law. Gupta (1967) tested real government expenditure relative to real income for five different countries (U.S., U.K., Sweden, Canada, Germany) and finds an income elasticity, the equivalent of our δ, to be greater than unity. Bird (1971) used a similar specification for four countries (U.K, Germany, Sweden and Japan) over different subperiods and found evidence supporting Wagner's Law. He estimates income elasticities ranging from 1.02 for Japan to 3.90 for Germany in his most recent subperiod. Ganti and Kolluri (1979) formulate their test in per capita terms in relation to the U.S. and find a δ of around 2.[10]

Gandhi (1971) looks at cross-section studies of Wagner's Law, and finds that Wagner's Law appears to hold for a sample of both rich and poor countries, but does not hold if only the poorer countries are taken into consideration. Gandi and Kolluri (1979) argue that Wagner's Law requires not only an income elasticity greater than unity but also a

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[6] See Beck (1976), Tyler (1996), Ferris and West (1996b, 1999), Tiongson (1997).
[7] See Perkins (1977), Pommerehne and Schneider (1982), Gramlich (1985), Lybeck (1986, Ch.5).
[8] See, for example, Ferris and West (1996a).
[9] See Peacock and Scott (2000), pp.1-2.
[10] See Henrekson (1993), p. 409.

rise in the per capita quantity and/or quality of public services. The latter condition is not met in a sample of only less-developed countries.[11] Gandi's finding seems to accord to what Abizadeh and Grey (1985) find when they test the hypothesis for a pooled time series/cross section sample of 55 countries. By dividing the sample in three groups according to level of GDP per capita, they find support of Wagner's Law for the two richer groups but not for the poorer group.

Finally, while most studies have looked at income elasticity relative to aggregate public expenditure, Borcherding and Deacon (1972) test equation (2) above on U.S. data at the state level for a wide variety of different public goods and services. They find income coefficients, i.e., values for δ-1, that range from 0.0421 for sanitation services to 2.7359 for parks and recreation. Since the elasticities for all seven expenditure groups were greater then zero, this was interpreted as support for Wagner's Law.[12]

In evaluating these studies, one must be aware of potential methodological problems. From an econometric point of view, we must take into account that when time series data is used the underlying variables are often not stationary in levels. In the case of Borcherding and Deacon (1972) this is not a problem, since their study looks at data at a particular point in time, namely 1962. However, when the study's purpose is to analyze the evolution of the government's share of GDP over time, then the time series properties of the dependent as well as the independent variables must be recognized in order to make correct statistical inferences on the estimated parameters.

These considerations have spurred a new wave of studies on Wagner's Law where more explicit attention is given to the time series properties of the data. From this perspective, one of the major shortcomings of the older literature on government growth has been the implicit assumption that the respective time series were stationary in their levels. Often this is not true, following stochastic processes that contain unit roots. In such cases, ordinary least squares (OLS) estimations done on the level values of these variables yield inconsistent estimates of the income elasticity if the two series are not cointegrated. In addition, such spurious regressions tend to be characterized by artificially high values of the R^2 and low Durbin-Watson statistics. On the other hand, if the two time series are cointegrated, then the problem of spurious regression in the sense of Granger-Newbold does not arise.[13]

It follows that one way of approaching the data is to run an Augmented Dickey-Fuller (ADF) test on the levels of the variables to check for the presence of a unit root. If that test indicates that the null hypothesis of a unit root cannot be rejected at a reasonable confidence level, we may conclude that the series are non-stationary in levels. If these variables allow rejection of the null when run in first differences, the variables are stationary in first differences or integrated of order one, I(1).

If the individual series are nonstationary in levels, we can proceed by testing whether the series are jointly cointegrated. This is done by regressing one series on another and applying the ADF test to the residuals. If the ADF result allows rejection of the null of a

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[11] See Gandhi (1971), pp.53-55.
[12] See Borcherding and Deacon (1972), p. 898.
[13] See Granger and Newbold (1974), Payne and Ewing (1996, p.260-1), and Henrekson (1993 p. 409-12).

unit root in the estimated residuals, then we can say that the two series are cointegrated of order one or CI(1,1). Under these conditions, an error correction model can be formulated and Wagner's Law may be tested through Granger-causality tests. More specifically, if we find that per capita income Granger-causes government size, then this is evidence that Wagner's Law holds.

Among the new studies that have approached Wagner's Law in this manner are Henrekson (1993), Bohl (1996) and Payne and Ewing (1996). Henrekson (1993) tests for Wagner's Law in Sweden using data from 1861 to 1990. He finds that that the levels of the two variables, real government size and per capita income, are not stationary and but become so upon first differencing. In addition, Henrekson finds that the two series are not cointegrated, so that no consistent estimate of income elasticity can be estimated. He concludes that no long-run relationship can be established for Sweden and hence that it is unlikely that "growth in real income *per se* caused the growth of government".[14]

Bohl (1996) tests for evidence of Wagner's Law on G7 countries using primarily post-World War II data.[15] He finds that all the time series variables are I(1). Furthermore, he finds evidence of a long-run relationship only for Canada and the UK. In all the other countries, the null hypothesis of non-cointegration cannot be rejected. Bohl then proceeds to test for Granger causality in these two countries alone and concludes that that since real per capita income Granger-causes government size, Wagner's Law is supported.[16]

Payne and Ewing (1996) use an error correction model to test for Wagner's hypothesis on a sample of 22 randomly selected countries. Evidence of Wagner's Law is found only for Australia, Colombia, Germany, Malaysia, Pakistan and the Philippines. Bi-directional causality is found for India, Peru, Sweden, Switzerland, UK, U.S. and Venezuela and Granger causality is absent in Chile, Finland, Greece, Honduras, Italy and Japan.[17]

2.d. Income inequality between mean and median voter.

Another explanation of the growth of the public sector utilizes the political/electoral factors that underlie public choice theory. In this framework the size of government is determined, in part, by the rules and procedures of the voting process that lead to the resolution of political choices and where the allocative outcome of that voting process is strongly influenced by the distribution of income. The intuition for including income inequality as a determinant of government size has been developed in detail by Meltzer and Richard (1981). To do so they assume that government sector goods and services are pure public goods and serve a purely redistributive function. Then, under a majority-voting rule, the decisive voter in determining the scale of government becomes the median income earner.[18] The median voter sets the tax share and hence the amount of redistribution. Various studies on income distributions have confirmed that the typical distribution is skewed to right, so that median income is typically below the mean

[14] See Henrekson (1993), pp. 412-413.
[15] The G7 countries include: Canada, U.K., U.S., France, Italy, Japan, Germany.
[16] See Bohl (1996), pp. 196.
[17] See Payne and Ewing (1996), p. 258 and p. 271.
[18] For an alternative approach utilizing probabilitistic voting theory see, Coughlin and Mankiw (1981) and Enelow and Hinich (1989).

income.[19] The consequences for government size in this model are that voters with income below the median will always favor increased redistribution so that any change that increases mean voter income relative to median voter income will also increase government expenditure. Meltzer and Richard (1981) argue that changes increasing government size include such structural and demographic changes as the extension of suffrage to lower income families earlier in the last century and more recent increases in the proportion of retired voters and their effect on size through the social security system.[20]

If this were the only dynamic at work, redistribution would stop only when the median voter succeeded in redistributing enough to become the mean voter. There is another factor at work, however that does constrain the amount of redistribution. This is the disincentive that higher taxes create on the incentive to work and hence on the income available to be redistributed. Higher taxes then become the mechanism that effectively limits the scale of redistribution.

In a follow-up article, Meltzer and Richard (1983) test their model on U.S. data and find a positive relationship between the level of government expenditures and both the level of median income and the ratio of mean to median income. Later empirical research, however, has yielded inconsistent findings. Henrekson (1988) and Lybeck (1986) both reject the Meltzer-Richard hypothesis. On the other hand, Henrekson (1990) and Henrekson and Lybeck (1988) find support for the role of income distribution as a determinant of government growth for Sweden. In pooled cross-sectional, time-series data Kristov, Lindert and McLelland (1992) even find a negative coefficient for the income distribution variable, and in cross-country context Mueller and Murrell (1985,1986) find no more than weak evidence in support of the Meltzer-Richard model. For French time series data, Aubin and al. (1988) do find evidence supporting the role of the rent-seeking hypothesis as put forth by Meltzer and Richard.

In this context it is worth mentioning the work of Peltzman (1980). Peltzman models the growth of government as the result of changes in between-group and within-group income inequality. Either an increase in the former or a decrease in the latter could explain growth in government size. Empirically, Peltzman finds that the latter factor has been most prominent. In particular, an increase in within-group equality, i.e., the growth of a homogeneous "middle class", has played a dominant role in explaining the growth of the public sector following World War II.

2.e. Other factors influencing either the demand and/or supply of government

Much recent work on the determinants of government size has been devoted to analyzing the significance of the final set of political control variables, the m's in equation (2).[21]

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[19] A study particularly relevant to this article is "Income distribution in OECD countries" by A.B. Atkinson and al (1995).

[20] See Meltzer and Richard (1981) pp. 924-925.

[21] Although not explicitly discussed in the text, political considerations are increasingly incorporated into growth analysis. See, for example, Zak and Knack (2001)

We highlight two particular approaches. First, increasingly attention is being given to the incorporation of electoral politics and the role of interest groups into both formal models of public choice and their empirical counterparts.[22] In practice, many authors now incorporate political variables to control for the effects produced by changes in the strength of political interest groups who have an incentive to alter the real size of government.[23] These would include segments of the population that typically benefit from larger government size, such as the fraction of the population who are poor, disadvantaged and/or older. Others would include more organized groups who expect to benefit (lose) from a further expansion in the role of government, such as farm or urban lobbies, union groups etc. Finally, as government size has grown, so has its work force. There is then a direct incentive for government employees to vote for larger government and this feedback has also been incorporated into the analysis of government size.[24]

A second approach to finding relevant control variables has emphasized changes in the relative cost of raising funds. This is the particular focus of work by Kau and Rubin (1981). Their approach would suggest that such factors as a rise in the participation rate by women and the movement of economic activity from the farm to the city have lowered the cost to government of raising funds while the rise in self employment has raised the cost of collecting funds. To this list, and in anticipation of the work in later sections, we add the degree of openness of an economy as a constraint on the ability of government to raise tax revenues and hence as a constraint on government size. All of these factors have been found to be significant in their effect on government size.[25]

2.f. Government Size within a Growth Equation

While our attention has been focused on the determinants of government size, much of the recent work on government size has reversed the direction of causality to investigate the role of government size in relation to economic growth. This is in part a response to the growing interest in the empirical determinants of economic growth and in part because of the greater use of pure time series techniques (see section 2.d above).[26] From the perspective of the growth literature, however, the typical finding is that larger government size (measured particularly in terms of government consumption) lowers economic growth.[27] The importance of this finding for our work is that it suggests that the income coefficient in a single equation model of government size may incorporate too much of the causality running from size to income. The coexistence of competing theories of causality suggests that the two should be estimated simultaneously in order to determine the separate size and significant. We do this in the following section.

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[22] See, for example, Coughlin, Mueller and Murrell (1993) and Mueller (1993).

[23] See the work of Buchanan and Tullock (1975)

[24] Sometimes called the Buchanan/Tullock beaucratic-voting hypothesis. See also Ferris and West (1996a).

[25] See Ferris and West (1996a). Their work emphasizes the importance of viewing these factors in combination rather than as alternative explanations of government size.

[26] See, for example, Barro (1995),

[27] See, for example, Kormendi and Maguire (1985), Karras (1993) and Folster and Henrekson, (1999, 2000). Empirical work that emphasizes the investment nature of governmental activity often finds a positive effect of size on growth. See Barro (1990).

3. Evidence from Panel Data on twenty OECD Countries from 1970 to 1997

In this section we present the results of estimating a regression model of real government size along the lines of that outlined by Borcherding (1985) and presented as equation (2) above. Our first objective is to see if the consensus parameter values found for U.S. experience prior to 1970 bear any resemblance to those found for a panel of OECD countries over the post 1970 time period. In essence we are asking whether the variety of cultural, political, and specific time-period effects experienced across this set of OECD countries has resulted in a variety of growth patterns that resists incorporation into a single underlying theory. Our second objective is to ask whether the fact that government size and economic growth are determined simultaneously means that a model that focuses on one-way causality cannot measure accurately the separate contributions of each determinant of government size or economic growth. To do so we estimate a simple growth model where government size is a key determinant of economic growth, hence inverting the causality assumed in the government size equation. Here we find a Solow-type growth model performs well as an explanation of real income and output growth. The third objective is to put the two relationships together by jointly estimating the two equations as part of a system under three stage least squares. This allows us to determine whether there is likely to be a significant bias when the simultaneity of the relationship is not accounted for econometrically.

3.a. Determinants of the Real Size of Government

In Table 1 we present a series of single regression equations that test the model of government size outlined in equation (2) above.[28] All equations utilize White's adjustment for heteroskadisticity, present the standard errors of the coefficients in brackets below each coefficient estimate, and include the important elasticities of the underlying demand equation (implied by the coefficient estimates) at the bottom of each equation column. Our equations utilize up to five explicit public choice control variables: the fraction of the population older than sixty five (Oldpop), the fraction of the labour force that is self employed (Self), the ratio of exports to GDP (Openness), the Gini coefficient (Gini), and finally time.[29] The first of these variables, Oldpop, is designed to capture the political demand for social services by the older proportion of the public and is expected to be positively related to real government size. Self is expected to capture an important relative cost of tax evasion, since greater self employment gives individuals a greater opportunity to hide income and/or expense consumption (Kau and Rubin, 1981). The ex ante Gini coefficient is used to proxy the departure of median from mean income and Openness controls for what Rodrik (1998) calls an important empirical regularity

[28] Note that almost all these variables are nonstationary in their levels so that the use of either first differences and/or growth rates is the appropriate form in which to test the model.

[29] Our use of government consumption rather than a more comprehensive transfer inclusive measure of government to measure size means that other traditional public choice interest group measures, such as the relative size of the farm population, will be less important as a determinant of size. In our equation estimates, relative farm population size was consistently positive in its effect but not significantly so.

between a country's exposure to international trade and the size of its government.[30] Its inclusion is of interest in its own right because of the complicated way in which openness can influence both government size and economic growth individually and in combination.[31]

Insert Table 1 about here

Equation (1) presents our benchmark model of the traditional determinants of the growth in real government size. Equations (2) and (3) add the set of public choice variables and the Gini coefficient. Equations (4) through (6) utilize the panel feature of the sample by allowing for country-specific and time-period specific fixed effects, first individually and then in combination. Not that even our most basic equation explains more than fifty percent of the variation in the growth of real government size and, as the different fixed effects are added to the analysis, the equations come to account for almost seventy percent. This can be compared to Borcherding's (1985) finding that such equations could explain roughly fifty percent of the variation in size. What is also impressive is the consistency of the model's key coefficient estimates—i.e., across the six different models all of the estimates of the income and price elasticities are quite similar. Finally the fixed effects are significant both individually and in combination. Thus despite the finding of significant differences across OECD countries and across time-periods, the core predicted relationships between per capita income, relative cost and government size remain consistent in their estimated effect.[32]

Not only are the elasticity estimates derived from our OECD panel relatively constant across equations but the values of these estimates are also remarkably similar to those reported earlier for the U.S. in the pre-1970 period. In particular, our income elasticity findings (see the estimates of δ in the second last row) are centered about Borcherding's (1985) finding that the average value of the income elasticity of demand, δ, was about 0.400 (and hence inconsistent with Wagner's Law prediction of an income elasticity greater than one).[33] Similarly the price elasticity of demand, η, is insignificantly different from zero for all our estimates and so consistent with most other studies that have found the demand curve for government services to be highly inelastic. Finally, our typical finding in relation to publicness, i.e., that $\alpha \approx 1$, is consistent with other work that has found little "publicness" in the nature of government goods.[34] However, it is of interest to note that when both country and time-period fixed effects are present (i.e., the results in column (6)), more evidence of publicness is indicated than has usually been found.

[30] See also Ades and Glaeser (1999), Weinhold and Rauch (1999) and Dinopoulos and Thompson (2000).

[31] By including external conditions in the growth model below we hope to be able to distinguish between the effect of openness on trade and hence growth versus the effect of openness on government size and hence growth.

[32] For fixed effects, the omitted country was the U.S.A and the omitted year was 1970.

[33] Peltzman (1980) points out that in relation to permanent rather than actual income, income elasticity is much higher.

[34] Following Borcherding and Deacon (1972, p.899), $\hat{\alpha} \cong 1 + \dfrac{\hat{\theta} / (\hat{\eta} + 1)}{1 + \hat{\sigma}_{\eta}^{2} / (\eta + 1)^{2}}$.

It is only in relation to the fourth term in equation (2), i.e., testing for the prediction arising from changes in the distance between the mean and median voter, that we have been largely unsuccessful. Here the recent work of Milanovic (2000) on *ex ante* (factor income) measures of income distribution seemed to offer one potential test of the median income hypothesis. Greater income inequality (i.e., a larger Gini coefficient) indicates a larger discrepancy between median and mean income and hence, through the median voter model, a larger demand for government services and thus a larger real size of government. A time series of *ex ante* Gini coefficients would then allow us to estimate a coefficient for $\dot{k}$ in equation (2) above. Unfortunately, very few factor income Gini coefficients are available (Milanovic finds a maximum of five for some countries, with most countries having two or fewer observations). By interpolating between observations for the countries in our sample we did construct a time series (called Growthgini in Table 1). However its inclusion in the equation of columns (3) adds little to the explanatory power of the model. We attribute this to the sparsity of data rather than the inappropriateness of the test.[35]

The set of public choice variables (in (2)) do contribute significantly to the explanatory power of the basic government size equation.[36] In terms of the individual predictions, Openness is always negative and significantly so in all equation estimates.[37] This is then consistent with the public choice prediction that greater openness will expose government to greater tax/service competition and hence will constrain government size by raising the cost of collecting funds. The two other specific public choice variables, Oldpop and Self, are also significant determinants of government size before the different fixed effects are investigated. However while the fraction of the labor force that is self-employer typically has a significant negative effect on government size, the significantly positive effect of an aging population on size tends to disappear once the equations incorporate country specific dummies.

Finally, note that both the constant and an explicit time trend term remain significant throughout. This suggests the existence of some time-related but currently unexplained process that has significantly affected real government size. Holding constant the other coefficients in the equations, the two time coefficients suggest an inverted-U shaped pattern for government size over the sample period. The estimates of Columns (2) and (3) suggest that government size would have peaked towards the end of our time period (between 1995 and 1997), while the equations incorporating fixed effects suggest a peak somewhere more in the middle (between 1982 and 1985).

What can we conclude from this exercise? First, without resorting to the wider range of public choice variables now used to supplement explanations of government size, even

[35] Because of the greater use of proportional rather than majority voting in European countries (forming the large part of our sample), the median voter model's prediction may have inherently less explanatory power.

[36] A Wald test of the hypothesis that the group adds no explanatory power can be rejected (F = 16.8).

[37] Note that in levels both openness (exports as a fraction of GDP) and government size (G/GDP) grow through time (see also Rodrik,1998). However, because both are nonstationary in their level (and become stationary in first differences or growth rates) it is appropriate that openness enter the regression as a first difference.

the smallest set of traditional economic variables performs well and can explain at least fifty percent of the variation in the growth of real government size over this period. The addition of a small subset of potential public choice variables has a significant but quantitatively small effect on the explanatory power of the equation. Second, the estimates of the underlying coefficients are not substantially different from those found earlier and hence are not specific to U.S. experience in the period prior to 1970. That is, the period following 1970 does not appear to represent a statistical break from earlier periods, despite the fact that the direction of change is no longer only upwards. Third, the results suggest that there are significant country and time period effects. However such a finding does not preclude us from confirming the existence of a common, consistent pattern to government growth across countries through time.

3.b. The Effect of Public Sector Size on Growth

In Table 2 we present a series of panel regressions that focus on the relationship between real output growth and government size. These regressions allow for a constant across time periods and countries and, in the later regressions, allow this constant to vary by country and time-period. In these models the variable representing government size is its rate of change rather than its level. This is because government size is nonstationary for many of the countries in our sample and the use of its level (rather than first difference) would introduce the time series problems discussed earlier.[38] For the same reason we include the terms-of-trade variable in its first difference. However, it should also be pointed out that when the lagged value of the logarithm of real per capita income is included to test for convergence, the same time series issue is reintroduced. We are not sure how to deal with this problem.[39]

A simple Solow representation of the growth process suggests that real output growth will be driven by the rates of growth of the underlying factors of production and variations in the savings rate. For this reason our basic growth equation includes the ratio of gross capital formation relative to GDP (investment = savings rate) and the population growth rate. Most growth equations also test for conditional convergence and to incorporate this test we include the lagged value of real output (despite the time series problem that this introduces). While most such equations would incorporate a measure of human capital, our use of annual data precludes the use of the Barro-Lee measure (most often used for this purpose).[40] Finally we include an additional variable to capture the potential effects of external trade on growth. This is the change in the terms of trade (D(termsoftrade)). The hypothesis is that a positive trade shock should spur domestic production and hence growth. D(termsoftrade)) is then expected to be positively related to growth.

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[38] That is, the level is I(1) while most of the other variables in the equation are I(0). The rate of change of real government size is I(0).

[39] When the same regressions are rerun without the logarithm of lagged real income, all remaining coefficients increase slightly in absolute size while the adjusted R^2 falls from .404 to .310.

[40] These are available only as five-year averages. The unavailability of an annual series for schooling may not be a serious cross-section problem since our countries are similarly developed, but it may present a bigger problem over time.

Insert Table 2 about here

Before discussing the estimated coefficients, it is interesting to note that the addition of country-specific fixed effects have no significant on the equation's explanatory power, suggesting a degree of similarity in the growth process across countries that is not present in the analogous equation for government size. Specific time-period effects (common time effects across countries) do have significant explanatory power and, in combination, the two effects are found to be significantly different from zero.

In terms of the traditional variables in the growth model, the model without any fixed effect (Columns (1)) finds, as expected, that both the savings rate and the growth rate of labor are significantly positive determinants of output growth. This remains true when time-specific fixed effects are allowed for (as in Column (3)). However, when country specific fixed effects are added to the model (in Columns (2) and (4)), the population growth rate term loses both its sign and significance. The savings rate coefficient, on the other hand, remains significantly positive throughout, with the size of its coefficient tending to rise when the country dummies are present. Finally, all four equations are consistent with the conditional convergence hypothesis. The lagged value of the logarithm of real output is significantly negative in all versions of the growth model.[41]

In relation to external trade our results are mixed. The terms-of-trade effect is significantly positive (as expected) in the first two equations but the sign and significance change when the specific time-period fixed effects are introduced. Because the different time periods account for significant common effects across countries, the time period dummies may pick up the common component of the business cycle in our sample. To the extent this is what is being captured, the simultaneous fall in importance of the terms-of-trade variable suggests that at least part of the business cycle may be transmitted through external shocks to relative trade prices. At least in this form, however, the growth equation is not consistently supportive of the hypothesis that growth responds positively to favorable terms-of-trade effects.

The variable of primary interest to us is the effect of real government size on economic growth, where again our measure of size is government consumption expenditure relative to GDP. Holding constant the control variables discussed above, Table 2 indicates that an increase in the growth rate of real government (consumption) size has a consistently significant negative effect on real output growth. The size of that effect is reasonably constant across the different forms of the regression equation, diminishing only slightly from –0.377 to –0.276 as the fixed effects are introduced. The equation results are then

[41] The equations were also run using the logarithm of the initial per capita income level (initialvalue) as a constant for each country. Such a procedure cannot separate a test of the convergence hypothesis from the use of country dummies to allow for country specific differences. One example, corresponding to Table 2 column (1) is:

Growthry = .180 -.357Growthgsize -.020initialvalue +.634Growthn + .067d(tot) + .135 Savings rate
(0.027)(0.028) (0.0027) (0.201) (0.023) (0.026)
AdjR^2=.377; SE=.024

consistent with the hypothesis that government consumption size is inimical to economic growth.

3.c. Simultaneity in the Growth of Government Size and Real Income

While each model hypothesizes a negative relationship between the growth rate of government size and the growth rate of real output, the two models separately imply a direction of causality that runs opposite to the other. In this section, then, we re-estimate the two models as a system to determine the separate contribution of each part to the overall result.

Before presenting these finding, however, we consider the change that should be found in the size of the two coefficient estimates if the two-way causality suggested by each separate theory is jointly present in the data. First, if there is an important feedback from the growth of government size to income growth (as suggested by the growth equation), then we should find that the size of the income growth coefficient in the government size equation has been understated (in absolute terms) when estimated in isolation. That is, an exogenous increase in income growth will reduce the growth rate of government size, but that reduction in government size will produce a further increase in the growth of income. Then because the single equation attributes the change in government size to the full change in income, the inclusion of the reinforcing effect will understate the size of the uni-directional effect of income on government size. This in turn implies that the estimate of the income elasticity of the demand for government from the single equation (i.e., Wagner's Law) should be biased upwards (since coefficient estimate equals $\hat{\delta}$-1).

When we turn to the growth equation and consider the coefficient on government size, the two-way effect again reinforces so that the single equation estimate will again understate (in absolute terms) the size of the one-way effect. Here the growth in real government size lowers the income growth rate and that, in turn, further lowers the growth rate in government size. The incorporation of both these effects in the single equation reduced form estimate will then attribute too little power to the negative effect of government size on income growth. The re-estimated coefficient should be larger.

Insert Table 3 around here

In Table 3 we present the panel regression results when the two equations are estimated simultaneously under three stage least squares.[42] Note that when the explanatory power of the government size and growth equations in Table 3 is compared to their single counterpart (in Tables 1 and 2), the government size model can be seen to retain more of its explanatory power than does the growth equation regression model.[43] This suggests

[42] Table 3 presents only those combinations of county and time-period fixed effects across the two equations that permitted matrix inversion.

[43] The adjusted R^2 of the government size equation remains largely unchanged while the adjusted R^2 of the growth equation falls considerably.

that the government size equation may be more accurately specified than is the growth equation. Our findings for both equations, however, are not strongly support of two-way causality, at least in the short run. The growth equation, in particular, shows little evidence of the expected feedback. The final government size coefficient in Table 2 (.276), for example, is of approximately the same size as that estimated in equation (3) of Table 3 (.234) while being larger (rather than smaller) than the other three cases. Our findings after re-estimating the government size equation are more promising. Even though the coefficients of the simple form of the government size equation (in columns (1) and (2)) show little change when estimated simultaneously, the introduction of the country-specific fixed effects (and oil-shock dummies) do produce the expected effects on the size of the coefficient estimates for income growth. In equations (3) and (4) of Table 3, the elasticity estimates (-0.605 and -0.740) are both larger in absolute terms than the corresponding coefficient in equation (4) of Table 1 (.576). There is then some support for the hypothesis that the single equation estimate is likely to attribute too little explanatory power to the independent variable, at least in the case of the government size estimates. However such support is limited and even with this readjustment, the downward revision in the estimated value of the income elasticity of demand for government services only reinforces our earlier finding that its income elasticity is well below one, implying that Wagner's Law even less likely to be operative.[44]

Overall, then, the simultaneous equation estimates give little reason to believe that the usual single equation estimate will significantly understate the negative effect of government (consumption) size on income growth or the effect of per capita income on government size. In terms of contemporary causality, there is some suggestion of interdependence only for the case of government size. It remains unanswered whether more evidence of two way causality may reappear through dynamic interactions over time.

Turning to the other coefficients in the government size equation, three stage least squares estimation has made no discernable difference to the estimates of the size of the price elasticity of demand (compared to the single equation formulation). The price elasticity estimates remain close to zero, continuing to indicate a demand curve that is extremely inelastic. The system estimates suggest slightly more publicness in the nature of government consumption than did the single equation estimates (with the exception of of the final column in Table 1), however this tendency is strictly marginal. The implied values of the α coefficient never fall very far below one. In terms of the public choice variables, openness remains consistently negative in its effect on government size while both Oldpop and Self have their predicted sign but are only occasionally significantly different from zero. The cautioning note is again that the time coefficient remains a significantly negative determinant of government size, continuing to indicate the importance of some as yet unexplained time trend to the growth rate of government size.

When the coefficients other than government size in the growth regression are compared to their counterparts, only marginal differences are found. Simultaneous estimation has

[44] Again we note that the use of permanent rather than actual per capita income would affect the resul;ts in the opposite direction.

made no difference to our conditional convergence findings. Similarly the terms of trade variable retains its size and significance in the equations without fixed effects but, as in the single equation case, does loose its significance when country specific dummies are included. There is more of a change with respect to the estimates of the effect of labor and capital on growth--the coefficients on labor growth are now all slightly higher while their counterparts on capital (savings) are slightly lower. In addition, the labor coefficient repeats the pattern found in the early single equation regressions where the coefficient falls dramatically when country dummies allow for a different pattern of growth.

4. The "Quiet Side" of the Public Sector: Regulation as Spending

Posner in his classic 1971 paper "Regulation as Taxation" argues that fiscal instruments are but one of two instruments for executing public policy, the other instrument being regulation. Using Posner's methodology, a truer measure of public sector size would add to the budgetary costs, B, an estimate of the spending equivalent necessary to obtain private sector compliance with public rules and directives, R.[45] More generally, then, the real size of the public sector would be $g' = (B + R)/Y$, where Y is the measure of national product.

Leonard (1986) has also argued that public budgets will understate the size of the public sector by not recording what he calls the "quiet side" of public sector activity. He points to several sources of budget under-statement: promises of retirement benefits and social insurance, tax expenditures, subsidies in sales of public activities to favored groups but not others, and the aforementioned regulatory costs of government. He estimates that if one were to measure government at its full economic rather than budgetary cost, the U.S. federal government would be half again as big as its budget indicates! Somewhat earlier DeMuth (1980) had suggested similarly large figures. Unfortunately, the data behind these figures are rather more speculative than hard, so accepting them involves more an act of faith than an acceptance of evidence. For all writers, however, there are significant additional costs that the standard account of government size ignores.

Our task does not require us to assess the absolute size of government, g′, only its change. Even this is not easy and our research for this survey has failed to find a comprehensive study of the regulatory or "quiet side" costs of this Posnerian measure. On the other hand, we have discovered three interesting measures of the regulatory impact of the U.S. federal government over the 1970-2000 time period. None is definitive or even fully comprehensive and so their use does not provide the precise measure for adjusting the more orthodox measure of $g = B/Y$ we are seeking. Nonetheless, we discuss their work in the hope that their presentation will shed some light on the issue and generate interest in further exploration by others.

[45] For example, if the state of California mandated through its Coastal Commission (CCC) certain land uses, the cost to private parties of carrying out that regulation – their compliance costs – would be the R. Another way of adjusting B would be to add an estimate of the budgetary costs of obtaining the easements and agreements to accomplish the CCC's desired policy (Borcherding, 1976).

While it has become common to observe that the number of U.S. federal government regulations has grown enormously relative to almost every measure of output, it does not seem sensible to assume that R is simply proportionate to the absolute number of rules and edicts.[46] It might not be too far from the truth, however, to assume that the size of the bureaucracy, as well as the size of the budgets of those bureaus needed to enforce these regulations, would in some rough-and-ready way be related to the full Posnerian cost of these regulatory agencies.

With this in mind, we offer the evidence provided by, first, the Center for the Study of American Business (CSAB) at Washington University (St. Louis) and, second, studies coming out of the U.S. Office of Management and Budget. The latest CSAB study (Warren and Weidenbaum, 1999) concentrates on absolute measures of regulatory bureau expenditures and bureau employment since the sixties and shows them to be quite large. However, when compared either to the figures for non-military government spending or employment (*Statistical Abstracts of the U.S.,* 1998), the relative change over our period seems rather negligible. For example, in 1970 regulatory bureau spending was 1.2% of non-military federal spending. This has barely changed, rising to 1.3% in 1980 but falling again to 1.2% in both 1990 and 1999. Relative employment measures, on the other hand, do suggest a significant increase in regulatory activity. The ratio of regulatory to non-military employment roughly doubled, rising from 2.4% and 2.5% in 1970 and 1980 respectively, to 4.1% in 1990 and 4.7% in 1998. Unfortunately, no one has done the research to determine whether regulation at the state and local government level has changed equivalently or whether the rising pattern of regulatory employment has been matched in other OECD countries.

Two other studies, one by Hopkins (1996) and a later update by Lutters (1998), present different types of estimates of the impact of regulation on the private sector and the costs of complying with U.S. federal regulation. Hopkins and Lutters both suggest large – in fact, huge costs of both regulatory impact and compliance. However when measured *relative* to the economy as a whole or relative to federal spending, they indicate almost no rise for the period 1970 to 1998. Only Lutters can point to the Clinton years for a time when his measure of regulatory cost rose relative to the economy as a whole.

When we turn from studies that attempt to measure the full social cost of regulation to studies that attempt the somewhat easier task of measuring the degree of regulation across countries, several recent articles merit attention. Cross country measures of the degree of governmental regulation, indices of government effectiveness (Pryor, 2000), and the degree of regulatory burden (Kaufmann, Kray, and Zolda-Lobaton, 2000) have been derived. For our purposes, neither of these studies has been extended through time, nor is it clear that their methodology could shed much light on the question of whether the regulation has risen or fallen within any particular country. It is interesting, however,

[46] Wesbury (2001) points out that the number of pages of the U.S. Federal registry for 2000 was 83,000, somewhat less than the all-time high of 87,000 in 1980. He interprets this as indicating that the regulatory impact of government is nearly as high today as at its 1980 high point. That federal government budgets have grown a great deal since 1980 does not seem to enter his calculation.

to ask whether differences in the degree of regulation across countries can account for at least some part of the cross country differences in the more traditional GDP measure of government size. More formally, we ask whether the inclusion of a measure of the relative scale of regulation will improve the explanatory power of a cross sectional equation of the determinants of government size. Should it do so, its coefficient sign will indicate whether regulation has been a substitute for, or complementary with, the more traditional spending measure of government size.

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insert Table 4 around here

In Table 4 we present two cross-country regressions to investigate this question: one for the determinants of real government size, g/y; and the other for the determinants of real government consumption per capita. Both equations include the standard determinants of section 2 plus Pryor's (2000) index of the relative degree of regulation across countries (REGULATION99) and his additional index of the relative effectiveness of government policies (GOVTEFFECT99). Because Pryor's measures are developed in 1999 and our most recent time period was 1997, our test assumes that the 1999 measures were relevant in 1997. Pryor's OECD countries also did not include Korea (and did include Denmark and New Zealand), so that these regression are for nineteen rather than the twenty OECD countries used earlier. Because the regressions are in levels, both equations also include a dummy variable for Sweden (whose government size is distinctly different from the other OECD countries).

What is most interesting about these two equations is that in both REGULATION99 and GOVTEFFECT99 are found to be highly significant determinants of government size and government per capita spending. The probability that neither variable adds to the explanatory power of the equation is only three percent.[47] Because Pryor's index of government regulation runs from 1 to 10 with high numbers corresponding to less regulation, the significantly negative coefficient signs for REGULATION99 in both equations means that that relatively more regulation is associated with larger government size. Regulation and government spending are complementary rather than substitutes for one another. Perhaps more straightforwardly, the significantly positive coefficient on GOVTEFFECT99 suggests that the more effective is government policy, the more government will be used and hence the larger will be government size.

Before leaving this topic it is also worth mentioning the literature that measures the growing size of the shadow economy and evaluates its connection with the hypothesis that the government's influence is becoming increasing indirect, impacting increasingly through regulation. Friedrich Schneider, in a paper read to the Public Choice Society (2000), collected together the results of currency demand estimates of the relative size of the underground economy for 18 different OECD countries. In all of these countries he could show that the relative size of the underground economy grew, sometimes rapidly

[47] The F statistic for the Wald test of whether the two coefficients equal zero is 4.48.

between 1970 and 1998.[48] In a more focused analysis of Austria, Schneider developed a methodology that could attribute the size of the underground economy to four underlying causes: direct taxes, indirect taxes, the complexity of taxes and the intensity of regulation. In the case of Austria, Schneider found that the percentage of the underground economy that could be attributed to regulation rose continuously from 11.8% in 1970 to 26% in 1995. To the extent that Austria is representative of other OECD countries and to the extent that the size of the underground economy measures the influence of government on the economy, Schneider's work reinforces earlier suggestions that more attention should be placed on regulation as a meter of government activity. It is likely that of the two types of Posnerian instruments, regulation has risen in relative importance.

To summarize our findings, the hypothesis that regulation-as-taxation estimates would change the measure of the relative growth of government is a proposition that cannot be readily sustained given the evidence at hand. Severe deficiencies of data and a dearth of research on the subject make the constant g' hypothesis since 1970 more speculative than authoritative. Although we are not confident enough to suggest that ignoring regulation-as-taxation does great harm for the last three decades of U.S. experience, we are more confident that ignoring the implicit tax effects of regulation over the longer 1900 to present interval will grossly understate both the relative size of government and its growth.[49]

5. **Conclusion**

In this paper we have examined the real size of government in the period following 1970 and explored some of the literature developed to explain the new growth patterns that have arisen. Our first important finding is that the traditional measure of government size has no longer simply grown. A significant number of developed countries experienced either constancy or a reduction in their real government size. Despite this, we find that the earlier approaches taken to explain the growth in government over time are still robust in their ability to explain the newer variety of growth patterns that have emerged over our set of twenty OECD countries. In presenting these results we have also noted that in the modern growth literature, the consumption measure of government size has usually been thought to have a negative influence of income/output. Thus in the context of the government size literature, this suggests the presence of an important two-way relationship between government size and income that should be accounted for in the government size equation. Re-estimating the government size and growth equations as a system, however, indicates that the single equation estimates of the size of the income effect on government size and the effect of government size on growth do not change substantially. There is some evidence that single equation estimates may understate the effect of income on government size, but even the implied downward revision in the size

[48] In some cases the rise has been dramatic, e.g., U.S. rising from 2.6-4.6% in 1970 to 8.9% in 1998; U.K. rising from 2% to 13%; Italy from 10.7% to 27.8%; and France from 3.9% to 14.9%.

[49] Few doubt that since 1900 regulation has grown not only absolutely but also relative to the federal budget [prior to 1990 only state and local governments mattered (Hughes, 1990)]. We are reasonably confident that future research will look at the twentieth century as the regulatory century and think of Wagner's law in terms of regulation as well as in terms of government budget expenditures.

of the income effect on government consumption does not change our conclusion with respect to Wagner's Law.

Finally our survey has explored the question of whether the GDP measure of government size may understate the "size" of the government sector due to the substitution of more indirect methods of control and influence for on-line budget expenditures. In effect, the "real" government size may still be growing if regulatory growth were incorporated properly in the measure. While data on this question is hard to come by and our current work suggests some reason for caution, our reading of the recent literature suggests that at a minimum the traditional measure of government size is becoming less useful as a measure of the government's influence over the economy. The importance of this question, combined with myriad of ways in which regulation both constrains and enhances economic performance, suggests that this a topic on which much more research is needed.

Table 1
Panel Regressions on the Determinants of the Growth Rate in Government Size
1970 – 1997 for Twenty OECD Countries

Ordinary Least Squares (OLS) with White Heteroskedasticity-Consistant Standard Errors

The dependent variable is the growth rate of (g/y)

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.010*	0.020*	0.022*	-0.010	0.353**	0.466**
	(0.002)	(0.003)	(0.004)	(0.006)	(0.154)	(0.227)
Growth(y/N)	-0.563*	-0.534*	-0.581*	-0.576*	-.506*	-0.608*
	(0.047)	(0.040)	(0.047)	(0.041)	(0.056)	(0.063)
Growth(p_g/p)	1.023*	0.989*	0.918*	0.999*	0.983*	0.978*
	(0.059)	(0.061)	(0.070)	(0.045)	(0.063)	(0.062)
Growth(N)	0.146	-0.224	-0.082	-0.154	-0.343	-0.680
	(0.242)	(0.226)	(0.239)	(0.373)	(0.206)	(0.379)
D(Openness)		-0.097*	-0.098*	-0.105*	-0.059**	-0.082*
		(0.026)	(0.030)	(0.024)	(0.027)	(0.027)
Time		-0.001*	-0.001*	-0.001*	-0.024*	-0.034**
		(0.0002)	(0.0002)	(0.0001)	(0.010)	(0.0156)
D(Oldpop)		1.531**	1.413	0.429	1.741*	-0.016
		(0.688)	(0.848)	(0.708)	(0.667)	(0.846)
D(Self)		-0.231**	-0.219	-0.166	-0.238*	-0.196**
		(0.099)	(0.183)	(0.105)	(0.091)	(0.096)
Growth(Gini)			0.0354			
			(0.057)			
Fixed Effects: Countries	No	No	No	Yes F = 4.47 Prob = 0	No	Yes F= 4.88 Prob = 0
Fixed Effects: Time Period	No	No	No	No	Yes F = 3.80 Prob = 0	Yes F = 4.50 Prob = 0
No. of Observations	540	473	368	473	473	473
Adjusted R^2	.542	.573	.583	.623	.629	.678
Standard error of Regression	0.0255	0.0223	0.0218	0.021	0.021	0.019
Implied Elasticities:						
Price, η	0.023	-0.011	-0.082	-0.001	-0.017	-0.022
Income, δ	.437	.466	.419	.424	.494	.392
Publicness, α	1.146	0.774	0.911	.846	0.652	0.307

Statistically different from zero at 1% (*), 5% (**)

Source: OECD Statistical Compendium (CD Rom, 1999). National Accounts I and Labour Market and Social Issues: Annual Labour Force Statistics (see Data Appendix)

Countries include Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Ireland, Japan, Korea, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, U.S.A.

Factor Income Gini Coefficients from Milanovic (2000, Appendix).

Table 2
Panel Regressions for Growth Effects
1970 – 1997 for Twenty OECD Countries

OLS with White Heteroskedasticity-Consistant Standard Errors in brackets
Dependent variable is the Growth in Real Output (i.e., $\dot{y} / y$)

Independent Variables	(1)	(2)	(3)	(4)
Constant	0.264*	0.332*	0.236*	0.219
	(0.032)	(0.061)	(0.034)	(0.116)
Growth(g/y)	-0.377*	-0.365*	-0.297*	-0.276*
	(0.028)	(0.038)	(0.028)	(0.035)
$Lnrypc_{-1}$	-0.028*	-0.034*	-0.025*	-0.020
	(0.003)	(0.006)	(0.003)	(0.013)
Growth(N)	0.454**	-0.066	0.373**	-0.204
	(0.199)	(0.381)	(0.168)	(0.380)
D(TermsofTrade)	0.065*	0.069**	-0.007	-0.003
	(0.023)	(0.025)	(0.021)	(0.166)
Savings Rate	0.135*	0.153*	0.133*	0.142*
	(0.025)	(0.042)	(0.021)	(0.048)
Fixed Effects:	No	Yes	No	Yes
Countries		F = 1.34		F = 2.43
		Prob(0) = .16		Prob(0)= 0
Fixed Effects:	No	No	Yes	Yes
Time Periods			F = 10.51	F = 17.7
			Prob(0) = 0	Prob(0) = 0
Regression Statistics:				
Adjusted R^2	.404	.414	.588	0.609
Standard Error	0.023	0.023	0.019	0.019
Observations	540	540	540	540

Significantly different from zero at 1% (*), 5% (**).

Source: OECD Statistical Compendium (CD ROM, 1999). National Accounts I. Countries include Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Ireland, Japan, Korea, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, U.S.A.

Table 3
Joint Estimation of the Growth of Government Size
And the Growth Rate of Real Income
1970 – 1997 for Twenty OECD Countries

Government Size Equation **Dependent variable – growth of (g/y)**	(1) TSLQ	(2) TSLQ	(3) TSLQ	(4) TSLQ
Constant	0.014* (0.004)	0.013* (0.004)	0.058** (0.025)	0.028* (0.010)
Growth(y/n)	-0.305* (0.080)	-0.265* (0.074)	-0.605* (0.112)	-0.740* (0.088)
Growth(p_g/p)	1.009* (0.055)	1.030* (0.056)	0.974* (0.056)	0.950* (0.053)
Growth(N)	-0.102 (0.236)	-0.100 (0.243)	-0.183 (0.379)	-0.279 (0.372)
D(Openness)	-0.099* (0.026)	-0.095* (0.024)	-0.103* (0.022)	-0.108* (0.022)
Time	-0.001* (0.0001)	-0.001* (0.0001)	-0.001* (0.0001)	-0.001* (0.0001)
D(Oldpop)	1.282** (0.626)	1.258** (0.612)	0.441 (0.647)	0.460 (0.630)
D(Self)	-0.158 (0.109)	-0.147 (0.108)	-0.046** (0.024)	-0.110 (0.100)
Fixed Effects:	None	None	Country*	Country*
Size Equation Statistics AdjR^2 S.E of Regression η δ α	 .536 0.023 0.009 .695 .899	 .521 0.023 0.030 .735 .903	 .610 0.021 -0.026 .395 .813	 .610 0.021 -0.050 .260 .707
Growth: Dependent Variable is real income growth (y)				
Constant	0.258* (0.060)	0.261* (0.046)	0.266* (0.045)	0.401* (0.084)
Growth(g/y)	-0.123** (0.053)	-0.118** (0.053)	-0.234* (0.047)	-0.146* (0.051)
Lnrypc$_{-1}$	-0.027* (0.004)	-0.027* (0.004)	-0.028* (0.004)	-0.039* (0.008)
Growth(N)	0.606** (0.261)	0.602** (0.259)	0.634* (0.248)	0.045 (0.404)
D(TermsofTrade)	0.095* (0.026)	0.069* (0.026)	0.034 (0.025)	0.036 (0.025)
Savings Rate	0.114* (0.029)	0.130* (0.028)	0.115* (0.027)	0.016 (0.045)
Fixed Effects:	None	1974* 1979*	1974* 1979*	Country Effect** 1974*, 1979*
Growth Equation Statistics: AdjR^2 S. E. of Regression	 .250 0.024	 .267 0.024	 .334 0.023	 .321 0.023

Statistically different from zero at 1% (*), 5% (**).
Source: OECD Statistical Compendium (CD Rom, 1999). National Accounts I.
Countries include Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Ireland, Japan, Korea, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, U.S.A.

Table 4

Cross Country Regressions for Nineteen OECD Countries in 1997:
Determinants of Real Government Size and Real Government Spending per Capita

Dependent Variable: GSIZE Dependent Variable: RGCPC
Method: Least Squares

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	t-Statistic	Coefficient	t-Statistic
C	0.407614	2.334007	5741.128	1.722076
RELPRICE97	-0.093959	-0.722773	-2111.882	-0.854333
RYPC97	-2.37E-06	-0.991257	0.119668	2.352735
POPULATION97	-2.52E-09	-0.025277	-0.000569	-0.246702
SWEDEN	0.341674	34.21050	6561.428	30.91194
REGULATION99	-0.054089	-2.383198	-1239.948	-2.461159
GOVTEFFECTIVE99	0.038362	2.966039	818.3873	2.990238
R-squared	0.926422		0.917582	
Adjusted R-squared	0.889632		0.876373	
S.E. of regression	0.029482		628.0657	
Sum squared resid	0.010430		4733599.	
Log likelihood	44.36153		-145.0045	
Durbin-Watson stat	2.134336		2.128318	

Sources: See Data Appendix

Data from the OECD Statistical Compendium (CD Rom, 1999),

i. National Accounts I.

gdppc -- Gross Domestic Product per Head in US$ - current prices and current Ppps

population -- country population in hundreds of thousands

gcpc -- General Government Consumption Expenditures per Head in US$ - current prices and current Ppps.

gfcfpc -- gross fixed capital formation per head in current prices and current Ppps

exchrate -- national currency per US $

exportindex -- exports of goods and services volume indices (1990 = 100)

gdpdefl -- gross domestic product implicit price deflator (1990=100)

pg -- government consumption price gdp price deflator (1990=100)

pi -- gross fixed capital formation gdp price deflator (1990=100)

px -- export (gdp) price deflator (1990=100)

pm -- import (gdp) price deflator (1990=100)

gdpindex -- volume index (1990=100)

ii. Labour Market and Social Issues: Annual Labour Force Statistics

Civemp -- Civilian labour force

Ownwork -- Civilian employers and persons working on their own account

Pop65plus -- Total Population aged sixty five years and older

Ceagric -- Civilian employment in agriculature

Total Population -- LFSpop

All data is for 20 OECD countries from 1970 through 1997 (typically, 28 annual observations * 20 countries = 560 observations). Some observations not available.

Countries: Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Ireland, Japan, Korea, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK, US.

Transformations of the Data:

Most variables where transformed into natural logarithms, using the label Ln. Hence rates of growth were calculated as first differences in logarithms. Lngcpc = log(gcpc) = logarithm of government consumption per capita in current US$.

Both gcpc and gdppc were transformed into real variables by deflating by the UScpi. Eg.

Rypc = gdppc/uscpi and lnrypc = log(rypc)

Rgcpc = gcpc/uscpi and lnrgcpc = log(rgcpc)

Then, real size of government:

gsize = gcpc/gdppc and **lngsize** = log(gsize).

TermsofTrade = px/pm, **D(termsof trade)** = Termsoftrade – Termsof trade(-1).

Openness = exportindex/gdpindex, **D(Openness)** = Openness – Openness(-1).

Savings Rate = gfcfpc/gdppc.

Oldpop = Pop65plus/lfspop, **D(Oldpop)** = Oldpop – Oldpop(-1)

Self = Ownwork/Civemp, **D(Self)** = Self – Self(-1)

B. Other non OECD sourced data

Gini is taken from Milanovic B., 2000, *European Journal of Political Economy*, Appendix A. There the Gini coefficient is calculated on a per capita basis and the distribution is based on factor income prior to redistribution. Most countries had 3 to 4 observations and the Gini was interpolated linearly between observations and assumed to be constant both before and after the first and last observation. Of the twenty countries, observations were unavailable for Austria, Greece, Japan, Korea, Portugal, and Ireland and Switzerland had only one observation.

Regulation is the Total Index score of Table 1: Indices of Regulation-Laissez-faire for OECD Nations in the late 1990's. Pryor, 2000.
Government Effectiveness is the Total Index from Table A-2: Government Effectiveness Index, 1999. Pryor, 2000.
The numbers used after the variable names in Table 4 refer to the year. Hence Govteffect99 refers to 1999 value of the government effectiveness index and RYPC97 refers to real income per capita in 1997.

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